

TITLE OF THE INVENTION
APPARATUS AND METHOD FOR MANAGING CONTENTS IN
A COMPUTER

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This application is based upon and claims the
benefit of priority from the prior Japanese Patent
Application No. 2000-017218, filed January 26, 2000,
the entire contents of which are incorporated herein
by reference.

10 BACKGROUND OF THE INVENTION

 The present invention relates to a contents
management apparatus and contents management method in
a computer having a function of managing the number of
duplicated contents of music, movies or the like, which
15 can be stored in a storage medium.

 Conventionally, the copy of contents (copyrighted
materials) of music, movies and the like, which can
be stored in a storage medium, has been managed.
A balance has been considered between the protection
20 of copyright and the convenience of use by managing the
generation of copy and the number of copies.

 Recently, the concept of "move" has emerged
instead of copy management. While no original data is
erased in the copy management, data is transferred to
25 a different location (medium) and the original data is
erased in the "move." The digitization of contents
and the spread of networks form the background to the

emergence of "move" for protection against copy.

Since a copy has recently been made faithfully to the original through a network or the like, the copyright of the original becomes difficult to protect only by the copy management. Furthermore, no copyright can be managed by an unlimited move from medium to medium, e.g., the for-profit distribution of data (by move).

It is thus difficult to reliably management the duplication of the original data, especially the contents to be protected by copyright.

BRIEF SUMMARY OF THE INVENTION

The present invention has been developed in order to resolve the above problems. It is accordingly an object of the present invention to provide a contents management apparatus and contents management method in a computer, which allows contents to be easily written to a storage medium and read therefrom and managements the number of duplicate contents to be recorded on the storage medium to limit the duplication of contents and thus protect the contents by copyright.

In order to attain the above object, a first aspect of the present invention provides a contents management apparatus in a computer for managing the number of times contents are transferred between the computer and a recording and reproduction device, the contents management apparatus comprising:

management screen display means for displaying on a display section of the computer a library management screen of contents and a device management screen for managing contents of a device; and

5 contents management means for displaying the contents-transferable number of times, which is predetermined for each content, on the library management screen, and for displaying a number obtained by subtracting a predetermined number from the
10 contents-transferable number of times every check-out when contents are transferred from the library management screen to the device management screen, and displaying a number obtained by adding a predetermined number to the contents-transferable number of times
15 every check-in when the contents transferred to the device management screen are returned to the library management screen.

As described above, the contents library management screen and the device management screen are
20 displayed on the display section of the computer, and the contents-transferable number of times, which is predetermined for each content, is displayed on the library management screen. A number, which is obtained by subtracting a predetermined number from the
25 contents-transferable number of times every check-out, is displayed, while a number, which is obtained by adding a predetermined number thereto every check-in,

is displayed. The contents can thus be easily
written to a device storage medium and read therefrom.
Moreover, the number of duplicate contents that can be
recorded on the storage medium can be managed with
5 reliability.

A second aspect of the present invention provides
a contents management apparatus in a computer for
managing the number of times contents are transferred
between the computer and a plurality of recording and
10 reproduction devices, the contents management apparatus
comprising:

management screen display means for displaying on
a display section of the computer a library management
screen for managing transfer of contents between the
15 computer and each of the devices; and

contents screen selection means for selecting a
tag corresponding to each of the devices on the library
management screen and displaying a device management
screen for managing the device of the selected tag to
20 the forefront.

As described above, tags are displayed on the
library management screen. If one of the tags is
selected, its corresponding device management screen is
displayed to the forefront. Thus, a management screen
25 corresponding to each device can be selected easily and
a process for each device can be performed rapidly.

A third aspect of the present invention provides

a contents management apparatus in a computer for managing the number of times contents are transferred between the computer and a recording and reproduction device, the contents management apparatus comprising
5 display means for displaying on a display section of the computer a library management screen of contents and a device management screen for managing contents of a device,

wherein the library management screen serves to
10 display the number of times contents are transferable.

As described above, a library management screen having a security function and a device management screen are displayed on the display section of the computer correspondingly to each other. Therefore,
15 even when an operator processes contents the security of which is not managed, he or she can management the security by reading those contents from the device management screen and writing them to the library management screen, with the result that the number of
20 duplicate contents that can be recorded on a storage medium can be regulated with reliability.

A fourth aspect of the present invention provides a contents management method in a computer for managing the number of times contents are transferred between
25 the computer and a recording and reproduction device, the contents management method comprising the steps of:

displaying on a display section of the computer

a library management screen of contents and a device management screen for managing contents of a device, and displaying the contents-transferable number of times, which is predetermined for each content, on the library management screen; and

displaying a number obtained by subtracting a predetermined number from the contents-transferable number of times every check-out when contents are transferred from the library management screen to the device management screen, and displaying a number obtained by adding a predetermined number to the contents-transferable number of times every check-in when the contents transferred to the device management screen are returned to the library management screen.

According to the above contents management method, contents can easily be written to a device and read therefrom and duplicate contents, which can be recorded on a device, can reliably be managed.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated

in and constitute a part of the specification,
illustrate presently preferred embodiments of the
invention, and together with the general description
given above and the detailed description of the
5 preferred embodiments given below, serve to explain
the principles of the invention.

FIG. 1 is a block diagram schematically showing
a configuration of the overall contents management
apparatus in a computer according to an embodiment of
10 the present invention;

FIG. 2 is a block diagram showing details of
a contents assisted management system of the contents
management apparatus shown in FIG. 1;

FIG. 3 is a diagram showing an example of the
15 structure of a storage region of each medium;

FIG. 4 is a block diagram showing an example
of the internal structure of a PD (recording and
reproduction device);

FIGS. 5A to 5C are diagrams explaining the
20 features of three different storage mediums;

FIGS. 6A to 6C are diagrams each showing
a recording form of a check-in/check-out list to be
stored in a secret area of the contents assisted
management system;

25 FIG. 7 is a diagram explaining the recording
contents of a storage medium after check-in;

FIGS. 8A to 8C are diagrams each showing another

storage example of the check-in/check-out list to be stored in the secret area of the contents assisted management system;

FIG. 9 is a flowchart of check-in/check-out, which shows a procedure from determination of a type of a recording medium to selection of a process corresponding to the type of the recording medium;

FIG. 10 is a flowchart schematically showing a check-in process using a flag;

FIGS. 11A and 11B are diagrams each showing an example of display of a menu in an SD audio player;

FIG. 12 is a view showing an example of display of a screen of the SD audio player in the contents assisted management system;

FIG. 13 is a view showing a play list edit display of an SD library manager;

FIG. 14 is a view showing a PD edit display of the SD library manager;

FIG. 15 is a view showing a PD play list edit display of the SD library manager;

FIG. 16 is a view showing a CD edit display of the SD library manger; and

FIG. 17 is a view showing a file edit display of the SD library manger.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention will now be described with reference to the accompanying drawings.

FIG. 1 is a schematic block diagram showing a configuration of the overall contents management apparatus in a computer according to one embodiment of the present invention.

5 In FIG. 1, reference numeral 1 indicates a contents assisted management system (LCM) that is constituted of a computer such as a personal computer (PC). The system 1 comprises a hard disk (HDD) 2. Various types of application and data are stored in the
10 disk 2. A PD (portable device) 3 serving as a portable recording and reproduction device is connected to the system 1. A medium (MC: memory card) 4, such as an SD (secure digital) card, is provided detachably from the PD 3 as a memory medium. The PD 3 has a function of
15 recording and reproducing contents on and from the medium 4. The medium 4 contains identification information (MID) that is proper to the medium and cannot be rewritten. A contents decryption key that depends upon the medium 4 encrypts the contents stored
20 in the medium 4.

A CD drive 5 and a file system 6 are connected to the contents assisted management system 1. Audio data is stored in a CD (compact disc) set in the CD drive 5. The file system 6 imports file-format audio data from
25 outside through the WEB.

FIG. 2 illustrates details of the contents assisted management system shown in FIG. 1. In this

embodiment, music is taken as one example of contents; however, movies or game software can be taken.

Further, the memory card (MC) such as an SD card is used as a medium; however, it can be replaced with

5 other storage mediums such as a floppy disk and a DVD.

The contents assisted management system 1 is able to process various digital contents such as music data and image data. In this system, contents are protected and managed on the premise that the encryption and decryption of contents are managed for each of recording mediums on which the contents are to be recorded, using a medium ID of the recording medium.

10

This aims at allowing the contents to be reproduced even when the same recording medium is used in different personal computers and electronic equipment.

15

The contents are encrypted and recorded using a dedicated medium ID prepared for each recording medium. The management of encryption/decryption of contents using a medium ID is executed by a secure manager 11 as software dedicated thereto. The secure manager 11 is achieved as tamper-resistant software. The tamper-resistant software has a function of protecting contents against unauthorized internal analysis and tampering.

20

The secure manager 11 works with application programs 12 provided in the hard disk 2 to execute various types of process such as "recording,"

25

"reproduction," "copy" and "move" with respect to contents to be protected and managed. The secure manager 11 serves as an SD (secure digital) audio player.

5 The hard disk 2 includes a license storage section 13, a music data storage section 14, a secret area driver 15, and a check-in/check-out list storage section 16. The PD 3 is connected to the secure manager 11 through a PD I/F (interface) section 17,
10 as is the CD drive 5 through a CD I/F section 18. Moreover, a user I/F section 19 and a time-out determination section 20 are connected to the secure manager 11, as is a reception section 22 through an EMD (electronic music distribution) I/F section 21.
15 The reception section 22 receives encrypted contents or their licenses (a condition of use and a decryption key of the encrypted contents) from a WEB server 24 via the Internet 23. The reception section 22 may have a reproducing function or an accounting function.
20 The reproducing function is used for a test-listen to distributed music contents, while the accounting function is used to purchase favorite contents.

 The music contents that a user has purchased are sent to the secure manager 11 via the EMD I/F section
25 21. If necessary, the music contents are decrypted by the EMD I/F section 21 and subjected to format conversion and re-encryption. Upon receiving encrypted

contents, the secure manager 11 stores them in the music data storage section 14 and stores a music data decryption key in the license storage section 13. The secure manager 11 may have a reproducing function. The reproducing function allows the music contents managed by the secure manager 11 to be reproduced on a PC.

The secure manager 11 has a function of supplying contents data to the PD 3. The PD 3 can reproduce contents from the medium 4.

The medium 4 has identification information (MID) that is proper to the medium and cannot be rewritten. A contents decryption key that depends upon the medium 4 encrypts the contents stored in the medium 4. This key is encrypted by an encryption key Kp stored in the PD 3 and then recorded on the medium 4.

The contents and contents decryption key in the medium 4 can be copied onto another storage medium (referred to as MCB hereinafter).

1. Contents are not reproduced from the MCB correctly without using a legitimate PD 3 since only the legitimate PD 3 includes the encryption key Kp; however,

2. Since the identification information MID of the medium 4 cannot be copied, the identification information MID of the MCB differs from that of the medium 4 which is the source of copy, with the result that the contents copied onto the MCB cannot be

reproduced correctly. In other words, the duplicate contents recorded on the medium 4 by the secure manager 11 are inhibited from being copied to other MCs one after another and then utilized.

5 Check-in/check-out will now be described in accordance with the contents assisted management system 1 shown in FIG. 2.

09706346-01801
10 The term "check-out" means that the system 1 stores contents as "parent" and copies their duplicates onto the medium 4 as "child" contents. While the "child" contents can freely be reproduced by the PD 3, no "grandchild" contents can be reproduced from the "child" contents. The number of "children" generated from the "parent" is defined as an attribute of
15 "parent." The term "check-in" means that the system 1 writes the "child" contents of the medium 4 back to the "parent" contents or erases them (or prevents them from being used), with the result that the "parent" contents in the system 1 recover the right to make one "child."
20 This is also called check-in at "parent."

Next, the check-in/check-out and the means for managing recording of contents on the medium 4 through a network will be described in the order of items presented below.

25 1. Check-in/check-out

 (1-1) Check-in/check-out

 (1-2) Check-in/check-out of duplicate contents

using an MC of level 2

(1-3) Another method of managing duplicate contents using a check-in/check-out list

(1-4) Reproduction of duplicate contents stored
5 in the MC of level 2

(1-5) Check-in/check-out and reproduction of duplicate contents using an MC of level 1

(1-6) Check-in/check-out and reproduction of duplicate contents using an MC of level 0
10 2. Means for managing recording of duplicate contents on an MC through a network

3. Secret area (check-in/check-out)

In order to achieve check-in/check-out, the storage region of the medium 4 includes an area where
15 neither reading nor writing is permitted by a disclosed procedure (secret area), and information necessary for decryption of contents is recorded in the secret area (see FIG. 3). The storage region of the contents assisted management system 1 (e.g., a secret area on
20 the hard disk 2 that can be accessed only by an undisclosed procedure when the system 1 is constituted of a PC) includes a check-in/check-out list storage section 16, and a check-in/check-out list, as will be described later, is stored in the section 16 (see
25 FIG. 3). Furthermore, the storage region of the PD 3 includes an area that can be accessed only by an undisclosed procedure (secret area), and information

necessary for decryption of contents can be recorded in the secret area (see FIG. 3). The area of the storage region other than the secret area, which can be accessed by a normal procedure, is called a public area.

The secret area of the contents assisted management system 1 shown in FIG. 2 includes the secret area driver 15 and check-in/check-out list storage section 16. The secret area driver 15 is designed to read data from the secret area after the secure manager 11 executes a secret specific procedure for accessing the check-in/check-out list storage section 16.

As FIG. 5C shows, the medium 4 includes a public area 4a, an identification information storage section 4b, a secret area 4c, an authentication section 4d and a switch (SW) 4e. The identification information storage section 4b stores identification information MID that cannot be rewritten or copied from outside. The authentication section 4d authenticates a user whenever the user accesses the secret area 4c. If the user is identified as an authorized person, the switch 4e opens a gate such that the user can access the secret area 4c. There are three types of medium 4 that can be applied to the embodiment of the present invention. The type of medium 4 including both the identification information MID and secret area, as shown in FIG. 5C, is referred to as level 2. The type

of medium 4 having not a secret area but identification information MID, as shown in 5B, is referred to as level 1. The type of medium 4 having neither a secret area nor identification information, as shown in 5A, is called level 0. For example, the level 0 can be distinguished from the other levels by the presence and absence of identification information MID, and the levels 1 and 2 can be distinguished from each other by the structure of identification information MID. When identification information is consecutive numeric values, if it is not smaller than a given value, the type of medium 4 is level 2.

The medium 4 will now be described taking level 2 as an example.

The medium 4 can be set in the PD3 connected to the contents assisted management system 1 or set in the system 1 directly.

FIG. 4 illustrates an example of the structure of the PD 3. The PD 3 comprises a CPU 3a, a RAM 3b, a ROM 3c, a flash memory 3d, an LCM I/F (interface) section 3e, a medium I/F (interface) section 3f, a decoding section 3g, a decoder 3h, and a D/A converting section 3i. The medium 4 is set in the medium I/F section 3f. When the contents assisted management system 1 reads/writes information from/to the medium 4 through the PD 3, it accesses a secret area of the medium 4 via a secret area access section of the PD 3. The medium

I/F section 3f includes a secret area access section for accessing the secret area of the medium 4.

The secret area of the PD 3 can be formed in the flash memory 3d. The ROM 3c stores programs for authentication

5 tion between the ROM 3c and the medium 4 and for distinguishing the types of medium 4. In accordance with these programs, the authentication and distinction are executed under the management of the CPU 3a.

10 Next, the check-in/check-out list stored in the secret area of the contents assisted management system 1 will be described.

15 All music contents held in the secure manager 11 have a contents ID (TID), which is identification information for identifying the respective contents, a predetermined number of contents to be duplicated or the remaining number of "children," and a check-out list as attribute information. This attribute information is called a check-in/check-out list. The check-in/check-out list is recorded in the
20 check-in/check-out list storage section 16 in the secret area as shown in FIG. 6A.

 In FIG. 6A, the remaining number of "children" for contents ID "TID1" is 2 and the check-out list thereof is L1.

25 The check-out list is a list of identification information of the medium 4 on which duplicate contents (children) are recorded. As is seen from FIG. 6A,

"child" contents of contents ID "TID1" are check out at two mediums 4 having identification information of m1 and m2 in the check-out list L1.

As shown in the flowchart in FIG. 9, when the medium 4 is set in the PD 3, mutual authentication is performed between them (step S1). When each of two parties determines that the other is legitimate (step S2), the PD 3 determines the type of medium 4 based on identification information MID read by the medium 4 (step S3).

When the type of medium 4 is level 0, a process of level 0 is performed (step S4). When the type is level 1, a process of level 1 is done (step S5).

Since the type of medium 4 is level 2, the PD 3 executes a check-in/check-out process according to the type (step S6).

As FIG. 6B shows, the secure manager 11 subtracts "1" from the remaining number n of children of contents of contents ID "TID1" to which a check-out request was made, and adds identification information "m0" of the medium 4 to the check-out list L1.

The storage contents of the medium 4, which is obtained when the above process is completed, are illustrated in FIG. 7.

FIG. 6C illustrates the status of the check-in/check-out list when a check-in process is executed. In the check-in process, the secure manager 11 adds "1"

to the remaining number n of children of contents of contents ID "TID1" to which a check-in request was made, and deletes identification information "m0" of the medium 4 from the check-out list L1.

5 A case where each of contents has a check-out attribute flag f such that a copyright holder can management a check-in at another contents assisted management system 1, will now be described.

10 FIG. 8A shows a format of the check-in/check-out list included in the contents assisted management system 1 in the above case.

15 As shown in FIG. 8A, a contents ID, the remaining number of children, a check-out list, and a check-out attribute flag f are registered in the check-in/check-out list of each content.

20 When the flag f is "1," the contents can check out and check in at another contents assisted management system 1. When the flag f is "0," the contents cannot at least check in at another contents assisted management system 1.

25 Let us consider that the contents of contents ID "TID6" check out. First, the secure manager 11 checks the check-in/check-out list to confirm that the check-out attribute flag of the contents is "1." When the flag is "0," the contents do not check out at this contents assisted management system 1. When the flag is "1," the secure manager 11 subtracts "1" from the

remaining number of children in the check-in/check-out list of contents ID "TID6" so that the number of remaining children is now "1" (see FIG. 8B). The check-out list L6 is empty (indicated by symbol ϕ) and the flag \underline{f} is "1." The contents can check in at the contents assisted management system 1 provided on another PC. No check-out list is therefore required. The flag \underline{f} is recorded in the secret area of the medium 4 together with random numbers \underline{r} .

A case of check-in at a contents assisted management system which is the same as or different from the contents assisted management system 1 at which the contents of contents ID "TID6" checks out, will now be described with reference to the flowchart shown in FIG. 10.

Authentication is performed between the medium 4 and the contents assisted management system 1 (step S11). Identification information MID is acquired from the medium 4 (step S12).

The secure manager 11 executes the foregoing procedure for the secret area 4c of the medium 4 (the legitimacy of both is confirmed by the mutual authentication and the switch 4e opens a gate to the secret area 4c) irrespective of whether the contents to which a check-in request was made are listed on the check-in/check-out list, and reads a flag \underline{f} out of the secret area 4c (step S13). When the flag \underline{f} is 1 (step

S14), data is deleted from the secret area and the public area (step S15), a folder is deleted (step S16), and the check-in/check-out list is updated (step S17). When the flag \underline{f} is 0, the process ends. Finally, when
5 the contents are not registered on the check-in/check-out list, a new check-in/check-out list (TID6, 1, ϕ , 1) in which the remaining number of children of the contents is "1" is registered. When the contents are registered on the check-in/check-out list, "1" is added
10 to the remaining number of children of the contents (step S17).

A process operation of the contents assisted management system 1 will now be described specifically. When the secure manager 11 of the system 1 starts,
15 an SD audio player 30 is displayed on the screen of a display device (not shown) of the system 1, as illustrated in FIG. 12. The display screen of the SD audio player 30 includes a player window 31 and a play list window 32.

20 The player window 31 has a playback state display window 40 in its central part. The window displays a song title, a play list, an artist, a playback position (time), a sampling frequency, a bit rate, a format type, a special playback mode, and the like. Above the
25 playback state display window 40, there are a minimization button 41 for holding a program in a task bar, an exit button 42 for exiting a program, a menu button 43

for displaying a menu, a manager window display button 44 for turning on/off a management window, a play list display button 45 for turning on/off the play list window 32, and a help button 46.

5 When the menu button 43 is pressed or clicked by a mouse, a main menu is displayed as shown in FIG. 11A. The main menu contains "Import from Audio CD ...," "Import from File ...," "Transfer to PD ...," "Play List Edit ...," "Play List Edit of PD ...," "Display >,"
10 "Option ...," "Help," "Version Information," "Exit" and the like. When a cursor moves to the position of "Display >" in the above menu, a display menu containing "minimization," "Play List Display" and "Manager Display" is displayed. In this case, a check
15 area is added to the head of each of "Play List Display" and "Manager Display."

 The "minimization" aims at holding the current state in a task bar as it is. The "Play List Display" aims at displaying the play list window 32 when a check
20 mark is present and closing it when a check mark is absent. The "Manager Display" aims at displaying the management window when a check mark is present and closing it when a check mark is absent.

 A playback mode designation button group 47 is
25 provided under the playback state display window 40. The group 47 contains buttons for selecting a special playback mode from among REPEAT, RANDOM and INTRO,

an OFF button for clearing the selected special playback mode, and a volume slider bar 48 for adjusting the volume of sound when music data is reproduced.

Whenever a user clicks the REPEAT button of the group 47, he or she selects one from among the modes of REPEAT, REPEAT ALL and REPEAT PLAY LIST. The REPEAT means playing back a designated tune over and over again. The REPEAT ALL means playing back from the current tune to the last tune through a play list, returning to the first tune of a first play list, and continuing the playback again. This playback continues until a user gives an instruction. The REPEAT PLAY LIST means continuing a playback of all tunes in a play list until an instruction to stop the playback is provided.

When a user clicks the RANDOM button, he or she can switch between RANDOM PLAY LIST and RANDOM ALL. The RANDOM PLAY LIST is a mode for randomly playing back tunes in a play list. The RANDOM ALL is a mode for randomly playing back tunes of all play lists. Clicking the INTRO button, the user can select an intro playback and, in this case, the beginning of each of tunes of all play lists is reproduced for five seconds. The volume slider bar 48 is used to adjust the volume of sound when music data is reproduced.

Under the playback mode designation button group 47 and the volume slider bar 48, there are a play list

move (forward) button 51, a backward skip button 52,
a fast-rewind button 53, a stop button 54, a play
button 55, a pause button 56, a fast-forward button 57,
a forward skip button 58, and a play list move
5 (backward) button 59.

The play button 55 is used to reproduce contents.
When the player stops, the button 55 allows the
currently-selected contents to be reproduced from the
beginning. When the player pauses, the button 55
10 continues a playback of contents. In a fast-forward/
fast-rewind mode, the button 55 restores it to a normal
play mode. When a user selects one of tunes in a play
list, the button 55 reproduces the selected tune.
If there is another tune in the play list, then it is
15 reproduced. When a playback of the last tune in the
play list is completed, a first tune in the next play
list is reproduced.

When any one of the REPEAT, PLAY LIST REPEAT,
REPEAT ALL, RANDOM PLAY LIST, RANDOM ALL and INTRO is
20 selected, a playback is performed in accordance with
the selected mode.

The play list move (backward) button 59 aims at
moving between play lists. During the playback, the
button 59 produces a first tune in the next play list.
25 During the halt of the player, the button 59 only
displays information of a first tune in the next play
list and does not reproduce it. The button 59 does not

operate during the reproduction or selection of the last play list.

5 The play list move (forward) button 51 aims at moving between play lists. During the playback, the button 51 produces a first tune in the preceding play list. During the halt of the player, the button 51 only displays information of a first tune in the preceding play list and does not reproduce it. The button 51 does not operate during the reproduction or selection of the last play list.

10

 The stop button 54 stops each of playback, fast-forward/fast-rewind, and pause operations to stop the SD audio player.

15 The pause button 56 stops each of playback and fast-forward/fast-rewind operations to stop the SD audio player.

 The fast-forward button 57 shifts an operation from each of playback and pause operations to a fast-forward operation. This button cannot be used when the player stops.

20

 The fast-rewind button 53 shifts an operation from each of playback and pause operations to a fast-rewind operation. This button cannot be used when the player stops, either.

25 The forward skip button 58 reproduces the next tune from the beginning in play mode.

 The backward skip button 52 reproduces the

preceding tune from the beginning in play mode.

The play list window 32 is designed to display a play list and select and reproduce a tune from the play list. The window 32 has an exit button 61 in its upper right end portion. In the row under the exit button 61, the window 32 includes an ALL music/play list radio button 62, a playback state display window 63, an ALL display light 64, and a LIST display light 65. The window 32 also has a play list component box 66 thereunder.

The ALL music/play list radio button 62 allows "ALL" or "PLAY LIST" to be selected as a method of displaying contents. After the player starts, the LIST display light 65 corresponding to the "PLAY LIST" is selected. When the "ALL" is selected, the play list component box 66 is impossible to operate.

The play list component box 66 is effective only when "PLAY LIST" is selected by the radio button 62. If "ALL" is selected, the box 66 displays the titles of all songs registered in a library in alphabetical order as a contents list. When "PLAY LIST" is selected, the box 66 displays songs of the selected play list in playback order. In either case, if a user double-clicks a song by a mouse or the like, the song is considered to be the current one and displayed on the reproduction state display window 63. The subsequent reproduction is performed in the same manner as the

normal reproduction of the play list. After all songs of the same play list are reproduced, the reproduction moves to the next play list. However, when "ALL" is selected, only one song is reproduced and the player stops. In random reproduction, the song is considered to be a first one and then the other songs are reproduced randomly.

The currently-reproduced song is displayed on the play list component box 66. A user can thus know the reproduction position visually.

The management window, which is displayed by the menu button 43 or the manager window display button 44 in the player window 31, will now be described.

[Play List Edit]

FIG. 13 shows an example of a display screen of an SD library manager in the play list edit mode of the management window 70. The management window 70 includes a minimization button 71, a maximization button 72 and an exit button 73 for exiting a program in its upper right end portion. The window 70 also includes a library display section 80 in its central part. The section 80 is designed to display a library for each library storing song data, and a tag is stuck to the device. As the tag, there can be provided a PD play list tag 74 for displaying a play list edit screen of the PD 3, a PD tag 75 for displaying an edit screen of the PD 3, a CD tag 76 for displaying an edit screen

of a CD, a file tag 77 for displaying an edit screen
of a song in file format, and a play list tag 78 for
displaying an edit screen of a play list. By clicking
these tags 74 to 78, their corresponding edit screens
5 are displayed.

When a user clicks the play list tag 78, data is
read out of the music data storage section 14 of the
hard disk 2 and the edit screen of the play list is
displayed as shown in FIG. 13.

10 The management window 70 includes a play list
display section 90 in addition to the library display
section 80 on the play list edit screen. The section
80 has a retrieval condition setting section 81, a
retrieval key setting section 82, a tag edit button 83,
15 an erase button 84, a play button 85, a stop button 86,
and a library list display section 87. An add button
88 and an add-all button 89 are provided under the
section 87.

The above retrieval condition setting section 81
20 is capable of retrieval from an artist, an album and a
play list. If a user chooses a condition for retrieval
by the section 81 and chooses a retrieval key by the
section 82, the music data storage section 14 is
searched for desired contents, and only the contents
25 are listed on the library list display section 87.
The display section 87 displays music data read from
the music data storage section 14 or an icon, the

contents-transferable number of times (the number of times the contents can be copied), a song title, an artist, an album title, a format, a genre, a file size, performance time, etc.

5 The uppermost song of the currently-selected contents can be managed by the play button 85 and stop button 86. During the play of the song, the player window 31, shown in FIG. 12, displays information of the song.

10 The erase button 84 allows contents to be erased in the display except the play list display, but it cannot be used in the play list display. When a user clicks the erase button 84, a warning dialog such as "Are you sure? The erased song cannot be restored." is
15 displayed. If the user certainly wishes to erase the currently-selected contents, they are erased. The tag edit button 83 reads a tug edit screen (not shown) to edit tug information such as an audio type, a bit rate, a copyright, a song title, an artist name, an album
20 title, a composer, a lyric writer, lyrics, and a genre.

 The play list display section 90 includes a play list box 91 and a contents list display section 100. The display section 90 also includes a new list button 92, a list delete button 93, a play list up button 94,
25 and a play list down button 95, which correspond to the play list box 91. The new list button 92 prepares a new play list called "New Play List #01" (the number

increases) and displays and edits a confirmation dialog of a play list name. The list delete button 93 erases the currently-displayed play list after the confirmation dialog is displayed. The play list up button 94 and play list down button 95 moves the play order of a selected play list up and down. The order can also be moved by a mouse in the list.

In the play list box 91, a play list can be chosen from a retrieval directory. A check box 96 is displayed at the head of the play list in order to confirm whether the play list is to be played or not. Only the checked play list is played on the player window 31. If a user edits a chosen play list and chooses another play list without storing the former, the play list box 92 displays a play list close dialog and asks the user whether he or she wishes to store it. The same operation is performed while a new play list is being edited. The name of a play list can be edited by clicking a mouse.

The play list display section 90 includes an update button 101, a clear button 102, an all-clear button 103, a play list save button 106, a contents up button 104, and a contents down button 105, which correspond to the contents list display section 100. The update button 101 inquires the current status of the music data storage section 14 again to display the current status. The clear button 102 clears the

selected contents, while the all-clear button 103 clears all contents displayed on the contents list display section 100. No dialogue is displayed to confirm whether the contents are cleared or not. The contents up button 104 and contents down button 105 moves the play order of selected contents up and down. The order can also be moved by a mouse in the list. The play list save button 106 catalogues an edit content in the currently-edited play list.

On the play list edit screen shown in FIG. 13, a user selects contents from the library list display section 87 and clicks the add button 88. Thus, the selected contents are added to the play list selected in the play list box 91 and displayed on the contents list display section 100. If the user edits the play list as described above and then clicks the play list save button 106, the play list displayed on the play list display section 90 is saved in the music data storage section 14. On the above play list edit screen, a play list can be prepared to arrange song data stored in the music data storage section 14 and the song data can be moved to the play list.

[PD Edit]

When a user clicks the PD tug 75 on the management window 70 illustrated in FIG. 13, the window switches to the PD edit screen shown in FIG. 14. The PD edit screen includes a library display section 80 and a PD

display section 110, and designates a song to be moved to the medium 4 such as an SD card set in the PD 3 and gives an instruction to transfer the song.

5 The library display section 80 has substantially the same structure as that of the library display section of the play list edit. However, the section 80 of the PD edit has in its lower part a return button 98 and a check box 99 containing play list information in addition to the add button 88 and the add-all
10 button 89.

The add button 88 registers the current library or the contents selected by the library list display section 87 in the list as a candidate to be transferred to the PD 3. The add-all button 89 registers all
15 contents, which are currently displayed on the display section 87, in the list as a candidate to be transferred to the PD 3. The return button 98 is used to return the contents selected by a PD contents list display section 112 to the library. The check box 99
20 containing play list information is operable when the library retrieval conditions are effective in the play list, and becomes gray and inoperable at the other times. If a transfer candidate is added when a play list is checked, the currently-displayed play list can
25 also be transferred to the PD3.

The PD display section 110 includes a medium select section 111 and a PD contents list display

section 112. The medium select section 111 allows a destination medium to be selected from among an SD card, an internal memory and an SD audio card. When the SD audio card is selected, only the file in AAC format can be transferred thereto. The PD display section 110 also includes a capacity display section 113, an update button 114, a transfer reservation clear button 115, a transfer reservation all-clear button 116, and an erase button 117 above the PD contents list display section 112. The capacity display section 113 displays a file capacity/a total medium capacity of selected contents.

The update button 114 inquires the current status from the PD 3 again and displays it. The transfer reservation clear button 115 clears contents, which are selected as a candidate to be transferred, from the list, but the contents themselves are left. The transfer reservation all-clear button 116 clears all contents, which are selected as candidates to be transferred, from the list, but the contents themselves are left. The erase button 117 is used to erase the selected contents after it confirms that a user wishes to erase them.

The PD display section 110 includes a progress status display section 120 as well as a transfer start button 118 and a stop button 119 under the PD contents list display section 112. The transfer start button

118 is used to actually transfer the contents, which are selected and displayed in gray on the PD contents list display section 112, to the PD 3. The transfer of the contents is stopped when a play list is

5 transferred. The stop button 119 is effective only during the transfer of contents and used to stop the transfer. When the transfer is stopped, the contents that have been already transferred are registered as they are, but no files are created for the contents
10 suspended during the transfer thereof. The progress status display section 120 displays the progress status of transfer on a progress bar that indicates how many songs have been transferred.

When a user clicks the add button 88 or add-all
15 button 89 to add the contents displayed on the library list display section 87 to the PD contents list display section 112 on the PD display screen described above, the contents-transferable number of times displayed on the list of the section 87 is decreased by one through
20 the foregoing check-out process. When the largest contents-transferable number of times is four, "3" is displayed first as the number and then "2", "1" and "0" are displayed in that order because the number is decreased by one every time contents are transferred.

25 Conversely, when a user clicks the return button 98 to return the contents displayed on the PD contents list display section 112 to the library list display

section 87, the contents-transferable number of times is increased by one through the check-in process described above.

[PD play list edit]

5 When a user clicks the PD play list tag 74 on the display screen of the library manger described above, the display screen is switched to the PD play list display screen shown in FIG. 15. The PD play list display screen includes a PD library display section
10 130 and a PD play list display section 140. Like the library display section 80, the PD library display section 130 has a retrieval condition setting section 81, a retrieval key setting section 82, a tag edit button 83, an erase button 84, a play button 85, a stop
15 button 86, and a library list display section 87. An add button 88 and an add-all button 89 are provided under a component box 137.

 The PD play list display section 140 includes a medium select section 141 and, like the play list
20 display section 90 shown in FIG. 13, it also includes a play list box 91 and a contents list display section 100. The medium select section 141 allows a user to select a medium to be edited from among an SD card, an internal memory, and an SD audio card. However, a play
25 list cannot be created bridging all of these mediums. Only the contents of the selected medium are displayed on the PD library display section 130 and PD play list

display section 140.

The PD play list display section 140 also includes a new list button 92, a list delete button 93, a play list up button 94, and a play list down button 95, which correspond to the play list box 91.

The display section 140 also includes an update button 101, a clear button 102, an all-clear button 103, a play list save button 106, a contents up button 104, and a contents down button 105, which correspond to the contents list display section 100.

When a user selects any one of the SD card, internal memory and SD audio card by the medium select section 141 on the display screen of the above PD play list, the recording contents of the selected medium are read out and displayed on the PD library display section 130 and PD play list display section 140.

The user can create a new play list (#1 ...) by clicking the new list button 92 of the section 140 on the above display screen and add an arbitrary song, which is selected from the library list display section 87, to the new play list. The user can also click the list delete button 93 to delete the selected play list.

If, moreover, the user clicks the clear button 102 and all-clear button 103, he or she can clear the selected song or all songs at once.

After the user edits the play list, he or she clicks the play list save button 106 to register the

edited contents in the currently-edited play list.

[CD edit]

When a user clicks the CD tag 76 on the display screen of the management window 70 described above, the screen is switched to the display screen displaying song data of a CD as shown in FIG. 16. The CD display screen includes a library display section 80 and a CD-ROM drive display section 150. The section 80 is the same as that of the play list edit screen illustrated in FIG. 13. The library display section 80 has a library list display section 87, and both a import button 97 and a stop button 119 are provided under the section 87. The CD display screen allows a user to only add contents to the library display section 80 from the CD by clicking the import button 97 on the CD display screen. The import button 97 thus starts to import contents of a check box 164 that is checked. The stop button 119 is effective only during the import of contents and used to stop the import operation. The contents that have been already transferred when the import is stopped, are registered as they are. No files are created for the contents suspended during the import thereof.

The CD-ROM drive display section 150 includes a bit rate select section 151, a total playing time display section 152, a progress status display section 165, a track list display section 153, a play list

component box 154, an album title component box 155,
an artist name component box 156, a genre component box
157, an update button 158, an all-select button 159, an
all-clear button 160, a play button 161, a stop button
5 162, and an eject button 163.

The bit rate select section 151 is capable of
selecting and designating one for encoding from among
a plurality of bit rates. The total playing time
display section 152 displays the total playing time of
10 a selected track.

The track list display section 153 displays
a selecting check box 164 for each track, together with
a song title, a track number, playing time, and a file
name. A user can fill a blank with song titles and
15 edit them by clicking a mouse. If the user checks the
check box 164, its corresponding contents are selected
as an object to be imported and the total playing time
is updated.

The play list component box 154 allows a user to
20 select a play list of the imported contents that the
user wishes to register. The selected information is
effective but inhibited from being converted during
the import. A user can choose a new play list or an
existent play list from the list displayed on the play
25 list component box 154. If the user chooses the
new one, he or she can edit a name of the play list.
The play list is thus created when the import process

starts.

5 A user can input an album title to be registered as tag information in the album name component box 155. The input information is effective but inhibited from being converted during the import. Neither edit nor selection can be performed in the box 155 when the apparatus starts for the first time.

10 A user can input an artist name to be registered as tag information in the artist name component box 156. The input information is effective but inhibited from being converted during the import.

15 A user can input a genre to be registered as tag information in the genre component box 157. The input information is effective but inhibited from being converted during the import. In order to help user's input, a genre such as pops, rock, hard rock, classical music, jazz, fusion, new music, hip-hop, blues, and traditional-style Japanese popular songs, is registered in advance.

20 The update button 158 is used to confirm the contents of a medium since there is a case where the displayed track information and the actual audio CD information are caused to differ from each other by inserting the medium again.

25 The all-select button 159 is used to put check marks in the check boxes 164 of all tracks displayed on the track list display section 153. The all-clear

button 160 is used to remove the check marks from all tracks displayed on the track list display section 153.

The play button 161 reproduces a specified track, and its reproduction information is displayed on the player window 31. The stop button 162 stops the reproduction.

The eject button 163 opens/closes a tray of the currently-selected drive.

The CD-ROM drive display section 150 of the above CD display screen displays songs stored in a CD-ROM (CD disc) set in the CD drive 5 shown in FIG. 2. A user can thus select an arbitrary song and click the play button 161 to play the selected song. The user can also select a track list displayed on the track list display section 153 and click the import button 97 to import it into a library. The imported track list can be displayed on the library display section 80 and its corresponding song can be moved to an arbitrary medium (a file) through the above operation.

[File edit]

When a user clicks the file tag 77 on the display screen of the management window 70, the display screen is switched to a file edit display screen as shown in FIG. 17. This file edit display screen displays songs in file format and is used to arrange song data, which is imported from outside via the WEB by the file system 6 shown in FIG. 1, and store it in a library or the

music data storage section 14 of the hard disk 2.

The file edit display screen includes a library display section 80 and a file select section 170. The library display section 80 is the same as that of the CD edit shown in FIG. 16.

Like the CD-ROM drive display section 150 shown in FIG. 16, the file select section 170 includes a bit rate select section 151, a total playing time display section 152, a progress status display section 165, a play list component box 154, an album title component box 155, an artist name component box 156, a genre component box 157, an update button 158, an all-select button 159, an all-clear button 160, a play button 161, and a stop button 162. The functions of these elements are the same as those in the CD edit described above and thus their descriptions are omitted.

The file select section 170 also includes a folder display section 171 and a file list display section 172.

The folder display section 171 displays folders stored in the hard disk 2. When a user selects a folder displayed on the section 171, the file list display section 172 displays files of the selected folder. The section 172 displays a selecting check box, a file name, a file type, playing time, and a file size for each file. When a user checks the check box, its corresponding contents are selected as an object

to be imported and the total playing time is updated.
In this case, it is only the files with extensions
like mp3 and WAV that are listed. If these files are
imported into the library, the names of the imported
5 files are changed in the extensions.

In the file edit display screen, the folders
stored in the music data storage section 14 of the hard
disk 2 are displayed on the folder display section 171.
If a user selects one of the folders, the files in the
10 selected one are displayed on the file list display
section 172. Checking the check box of a file
displayed on the section 172 and clicking the play
button 161, the user is able to reproduce a song
recorded in the file.

15 If the user also checks the check box of a file
displayed on the section 172 and clicks the import
button 97, the import of the selected file starts.
Since, in this case, the type of the file is displayed
in the file list only by the extension, it is likely
20 that a problem will occur in the contents of the file.
If that is the case, a dialogue box is displayed to
allow the user to choose "continue" or "stop" importing
the file. To stop the import of the file, the user
clicks the stop button 119. Files that have been
25 already imported when the import of the file is
stopped, are registered in their current format.

The progress status of import of the file is

displayed on the progress status display section 165.
For example, "XX songs of XXX songs completed" or "XX%"
is displayed in the progress bar. Alternatively,
the order of a song that is currently imported, the
5 estimated import time, and the percentage (%) of the
imported songs is displayed.

A file that is imported to a library in the manner
described above can also be reproduced if a user
selects the file and clicks the play button 85.

10 Note that, in the above embodiment, audio data is
recorded and reproduced; however, image data of movies
or the like (moving images) can be recorded and
reproduced.

As described above in detail, the present
15 invention provides a contents management apparatus for
managing the number of times contents are transferred
between a computer and a recording and reproduction
device. In this apparatus, the contents library
management screen and the device management screen are
20 displayed on the display section of the computer, and
the contents-transferable number of times, which is
predetermined for each content, is displayed on the
library management screen. A number, which is obtained
by subtracting a predetermined number from the
25 contents-transferable number of times every check-out,
is displayed, while a number, which is obtained by
adding a predetermined number thereto every check-in,

is displayed. The contents can thus be easily written to a device storage medium and read therefrom.

Moreover, the number of duplicate contents, which can be recorded on the storage medium, can reliably be managed.

In the present invention, furthermore, tags are displayed on the respective management screens of each of a plurality of devices. If one of the tags is selected, its corresponding management screen is displayed to the forefront. Therefore, a management screen corresponding to each device can be selected easily and a process for each device can be performed rapidly.

In the present invention, furthermore, a library management screen having a security function and a device management screen are displayed on the display section of the computer correspondingly to each other. Therefore, even when an operator processes contents the security of which is not managed, he or she can management the security by reading those contents from the device management screen and writing them to the library management screen, with the result that the number of duplicate contents that can be recorded on a storage medium can be regulated with reliability.

Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to

the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as
5 defined by the appended claims and their equivalents.

11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
98
99
100
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
116
117
118
119
120
121
122
123
124
125
126
127
128
129
130
131
132
133
134
135
136
137
138
139
140
141
142
143
144
145
146
147
148
149
150
151
152
153
154
155
156
157
158
159
160
161
162
163
164
165
166
167
168
169
170
171
172
173
174
175
176
177
178
179
180
181
182
183
184
185
186
187
188
189
190
191
192
193
194
195
196
197
198
199
200
201
202
203
204
205
206
207
208
209
210
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
232
233
234
235
236
237
238
239
240
241
242
243
244
245
246
247
248
249
250
251
252
253
254
255
256
257
258
259
260
261
262
263
264
265
266
267
268
269
270
271
272
273
274
275
276
277
278
279
280
281
282
283
284
285
286
287
288
289
290
291
292
293
294
295
296
297
298
299
300
301
302
303
304
305
306
307
308
309
310
311
312
313
314
315
316
317
318
319
320
321
322
323
324
325
326
327
328
329
330
331
332
333
334
335
336
337
338
339
340
341
342
343
344
345
346
347
348
349
350
351
352
353
354
355
356
357
358
359
360
361
362
363
364
365
366
367
368
369
370
371
372
373
374
375
376
377
378
379
380
381
382
383
384
385
386
387
388
389
390
391
392
393
394
395
396
397
398
399
400
401
402
403
404
405
406
407
408
409
410
411
412
413
414
415
416
417
418
419
420
421
422
423
424
425
426
427
428
429
430
431
432
433
434
435
436
437
438
439
440
441
442
443
444
445
446
447
448
449
450
451
452
453
454
455
456
457
458
459
460
461
462
463
464
465
466
467
468
469
470
471
472
473
474
475
476
477
478
479
480
481
482
483
484
485
486
487
488
489
490
491
492
493
494
495
496
497
498
499
500
501
502
503
504
505
506
507
508
509
510
511
512
513
514
515
516
517
518
519
520
521
522
523
524
525
526
527
528
529
530
531
532
533
534
535
536
537
538
539
540
541
542
543
544
545
546
547
548
549
550
551
552
553
554
555
556
557
558
559
560
561
562
563
564
565
566
567
568
569
570
571
572
573
574
575
576
577
578
579
580
581
582
583
584
585
586
587
588
589
590
591
592
593
594
595
596
597
598
599
600
601
602
603
604
605
606
607
608
609
610
611
612
613
614
615
616
617
618
619
620
621
622
623
624
625
626
627
628
629
630
631
632
633
634
635
636
637
638
639
640
641
642
643
644
645
646
647
648
649
650
651
652
653
654
655
656
657
658
659
660
661
662
663
664
665
666
667
668
669
670
671
672
673
674
675
676
677
678
679
680
681
682
683
684
685
686
687
688
689
690
691
692
693
694
695
696
697
698
699
700
701
702
703
704
705
706
707
708
709
710
711
712
713
714
715
716
717
718
719
720
721
722
723
724
725
726
727
728
729
730
731
732
733
734
735
736
737
738
739
740
741
742
743
744
745
746
747
748
749
750
751
752
753
754
755
756
757
758
759
760
761
762
763
764
765
766
767
768
769
770
771
772
773
774
775
776
777
778
779
780
781
782
783
784
785
786
787
788
789
790
791
792
793
794
795
796
797
798
799
800
801
802
803
804
805
806
807
808
809
810
811
812
813
814
815
816
817
818
819
820
821
822
823
824
825
826
827
828
829
830
831
832
833
834
835
836
837
838
839
840
841
842
843
844
845
846
847
848
849
850
851
852
853
854
855
856
857
858
859
860
861
862
863
864
865
866
867
868
869
870
871
872
873
874
875
876
877
878
879
880
881
882
883
884
885
886
887
888
889
890
891
892
893
894
895
896
897
898
899
900
901
902
903
904
905
906
907
908
909
910
911
912
913
914
915
916
917
918
919
920
921
922
923
924
925
926
927
928
929
930
931
932
933
934
935
936
937
938
939
940
941
942
943
944
945
946
947
948
949
950
951
952
953
954
955
956
957
958
959
960
961
962
963
964
965
966
967
968
969
970
971
972
973
974
975
976
977
978
979
980
981
982
983
984
985
986
987
988
989
990
991
992
993
994
995
996
997
998
999
1000
1001
1002
1003
1004
1005
1006
1007
1008
1009
1010
1011
1012
1013
1014
1015
1016
1017
1018
1019
1020
1021
1022
1023
1024
1025
1026
1027
1028
1029
1030
1031
1032
1033
1034
1035
1036
1037
1038
1039
1040
1041
1042
1043
1044
1045
1046
1047
1048
1049
1050
1051
1052
1053
1054
1055
1056
1057
1058
1059
1060
1061
1062
1063
1064
1065
1066
1067
1068
1069
1070
1071
1072
1073
1074
1075
1076
1077
1078
1079
1080
1081
1082
1083
1084
1085
1086
1087
1088
1089
1090
1091
1092
1093
1094
1095
1096
1097
1098
1099
1100
1101
1102
1103
1104
1105
1106
1107
1108
1109
1110
1111
1112
1113
1114
1115
1116
1117
1118
1119
1120
1121
1122
1123
1124
1125
1126
1127
1128
1129
1130
1131
1132
1133
1134
1135
1136
1137
1138
1139
1140
1141
1142
1143
1144
1145
1146
1147
1148
1149
1150
1151
1152
1153
1154
1155
1156
1157
1158
1159
1160
1161
1162
1163
1164
1165
1166
1167
1168
1169
1170
1171
1172
1173
1174
1175
1176
1177
1178
1179
1180
1181
1182
1183
1184
1185
1186
1187
1188
1189
1190
1191
1192
1193
1194
1195
1196
1197
1198
1199
1200
1201
1202
1203
1204
1205
1206
1207
1208
1209
1210
1211
1212
1213
1214
1215
1216
1217
1218
1219
1220
1221
1222
1223
1224
1225
1226
1227
1228
1229
1230
1231
1232
1233
1234
1235
1236
1237
1238
1239
1240
1241
1242
1243
1244
1245
1246
1247
1248
1249
1250
1251
1252
1253
1254
1255
1256
1257
1258
1259
1260
1261
1262
1263
1264
1265
1266
1267
1268
1269
1270
1271
1272
1273
1274
1275
1276
1277
1278
1279
1280
1281
1282
1283
1284
1285
1286
1287
1288
1289
1290
1291
1292
1293
1294
1295
1296
1297
1298
1299
1300
1301
1302
1303
1304
1305
1306
1307
1308
1309
1310
1311
1312
1313
1314
1315
1316
1317
1318
1319
1320
1321
1322
1323
1324
1325
1326
1327
1328
1329
1330
1331
1332
1333
1334
1335
1336
1337
1338
1339
1340
1341
1342
1343
1344
1345
1346
1347
1348
1349
1350
1351
1352
1353
1354
1355
1356
1357
1358
1359
1360
1361
1362
1363
1364
1365
1366
1367
1368
1369
1370
1371
1372
1373
1374
1375
1376
1377
1378
1379
1380
1381
1382
1383
1384
1385
1386
1387
1388
1389
1390
1391
1392
1393
1394
1395
1396
1397
1398
1399
1400
1401
1402
1403
1404
1405
1406
1407
1408
1409
1410
1411
1412
1413
1414
1415
1416
1417
1418
1419
1420
1421
1422
1423
1424
1425
1426
1427
1428
1429
1430
1431
1432
1433
1434
1435
1436
1437
1438
1439
1440
1441
1442
1443
1444
1445
1446
1447
1448
1449
1450
1451
1452
1453
1454
1455
1456
1457
1458
1459
1460
1461
1462
1463
1464
1465
1466
1467
1468
1469
1470
1471
1472
1473
1474
1475
1476
1477
1478
1479
1480
1481
1482
1483
1484
1485
1486
1487
1488
1489
1490
1491
1492
1493
1494
1495
1496
1497
1498
1499
1500
1501
1502
1503
1504
1505
1506
1507
1508
1509
1510
1511
1512
1513
1514
1515
1516
1517
1518
1519
1520
1521
1522
1523
1524
1525
1526
1527
1528
1529
1530
1531
1532
1533
1534
1535
1536
1537
1538
1539
1540
1541
1542
1543
1544
1545
1546
1547
1548
1549
1550
1551
1552
1553
1554
1555
1556
1557
1558
1559
1560
1561
1562
1563
1564
1565
1566
1567
1568
1569
1570
1571
1572
1573
1574
1575
1576
1577
1578
1579
1580
1581
1582
1583
1584
1585
1586
1587
1588
1589
1590
1591
1592
1593
1594
1595
1596
1597
1598
1599
1600
1601
1602
1603
1604
1605
1606
1607
1608
1609
1610
1611
1612
1613
1614
1615
1616
1617
1618
1619
1620
1621
1622
1623
1624
1625
1626
1627
1628
1629
1630
1631
1632
1633
1634
1635
1636
1637
1638
1639
1640
1641
1642
1643
1644
1645
1646
1647
1648
1649
1650
1651
1652
1653
1654
1655
1656
1657
1658
1659
1660
1661
1662
1663
1664
1665
1666
1667
1668
1669
1670
1671
1672
1673
1674
1675
1676
1677
1678
1679
1680
1681
1682
1683
1684
1685
1686
1687
1688
1689
1690
1691
1692
1693
1694
1695
1696
1697
1698
1699
1700
1701
1702
1703
1704
1705
1706
1707
1708
1709
1710
1711
1712
1713
1714
1715
1716
1717
1718
1719
1720
1721
1722
1723
1724
1725
1726
1727
1728
1729
1730
1731
1732
1733
1734
1735
1736
1737
1738
1739
1740
1741
1742
1743
1744
1745
1746
1747
1748
1749
1750
1751
1752
1753
1754
1755
1756
1757
1758
1759
1760
1761
1762
1763
1764
1765
1766
1767
1768
1769
1770
1771
1772
1773
1774
1775
1776
1777
1778
1779
1780
1781
1782
1783
1784
1785
1786
1787
1788
1789
1790
1791
1792
1793
1794
1795
1796
1797
1798
1799
1800
1801
1802
1803
1804
1805
1806
1807
1808
1809
1810
1811
1812
1813
1814
1815
1816
1817
1818
1819
1820
1821
1822
1823
1824
1825
1826
1827
1828
1829
1830
1831
1832
1833
1834
1835
1836
1837
1838
1839
1840
1841
1842
1843
1844
1845
1846
1847
1848
1849
1850
1851
1852
1853
1854
1855
1856
1857
1858
1859
1860
1861
1862
1863
1864
1865
1866
1867
1868
1869
1870
1871
1872
1873
1874
1875
1876
1877
1878
1879
1880
1881
1882
1883
1884
1885
1886
1887
1888
1889
1890
1891
1892
1893
1894
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
1929
1930
1931
1932
1933
1934
1935
1936
1937
1938
1939
1940
1941
1942
1943
1944
1945
1946
1947
1948
1949
1950
1951
1952
1953
1954
1955
1956
1957
1958
1959
1960
1961
1962
1963
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
2040
2041
2042
2043
2044
2045
2046
2047
2048
2049
2050
2051
2052
2053
2054
2055
2056
2057
2058
2059
2060
2061
2062
2063
2064
2065
2066
2067
2068
2069
2070
2071
2072
2073
2074
2075
2076
2077
2078
2079
2080
2081
2082
2083
2084
2085
2086
2087
2088
2089
2090
2091
2092
2093
2094
2095
2096
2097
2098
2099
2100
2101
2102
2103
2104
2105
2106
2107
2108
2109
2110
2111
2112
2113
2114
2115
2116
2117
2118
2119
2120
2121
2122
2123
2124
2125
2126
2127
2128
2129
2130
2131
2132
2133
2134
2135
2136
2137
2138
2139
2140
2141
2142
2143
2144
2145
2146
2147
2148
2149
2150
2151
2152
2153
2154
2155
2156
2157
2158
2159
2160
2161
2162
2163
2164
2165
2166
2167
2168
2169
2170
2171
2172
2173
2174
2175
2176
2177
2178
2179
2180
2181
2182
2183
2184
2185
2186
2187
2188
2189
2190
2191
2192
2193
2194
2195
2196
2197
2198
2199
2200
2201
2202
2203
2204
2205
2206
2207
2208
2209
2210
2211
2212
2213
2214
2215
2216
2217
2218
2219
2220
2221
2222
2223
2224
2225
2226
2227
2228
2229
2230
22